EXHIBIT A

THE ECONOMICS OF UNE PRICING[1]

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1. Introduction

The Telecommunications Act of 1996 requires incumbent local exchange carriers to provide certain elements of their network to their competitors on an unbundled basis at prices that are based on "cost." A significant regulatory challenge, since the passage of the Act, has been the determination of a methodology for assessing the costs for these unbundled network elements ("UNEs"). While state regulatory commissions have the authority and responsibility to actually determine UNE prices, the task of establishing a national cost methodology that states must follow falls to the Federal Communications Commission ("FCC" or "Commission") in its role as federal regulator of the telecommunications industry. In its First Local Competition Order,[2] the Commission defined a particular costing methodology which it called Total Element Long Run Incremental Cost ("TELRIC") and required state regulators to use this methodology when calculating UNE prices. The TELRIC methodology has undergone significant scrutiny and criticism since that time, and after nearly seven years of experience with TELRIC, it appears that the FCC itself now tentatively rejects at least some of the tenets of its original conception.

TELRIC is an example of a costing approach that more generally can be categorized as a "forward-looking economic cost methodology." Under a forward-looking economic cost ("FLEC") methodology for setting UNE prices, a regulator assumes or models a particular set of network assets that will produce the same outputs as the ILEC's current network, and estimates the total cost of building this network at current input and equipment prices. The regulator then performs the following

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2 *In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, CC Docket No. 96-98 and Interconnection between Local Exchange Carriers and Commercial Mobile Radio Service Providers, CC Docket No. 95-185*, First Report and Order, FCC 96-325, (August 8, 1996). (Hereafter, *First Local Competition Order.*)

calculations: (1) allocates these investment costs across periods[3] so that the ILEC will recover its assumed investment costs over the life of the assets, (2) estimates operating costs given the design, and (3) sets prices equal to the sum of allocated capital costs plus operating costs. Since the general definition of a FLEC methodology leaves unspecified the questions of how to choose the assumed network design and calculate the costs of building it, how to calculate operating costs, and how to allocate capital costs across periods, there are many different possible FLEC methodologies depending upon how these questions are answered.

The related questions of how to choose the assumed network design and calculate its construction costs and how to estimate the annual operating costs under the assumed design have been particularly controversial.[4] As states have interpreted the TELRIC standard,[5] they are supposed to calculate the costs that would result if the most efficient possible network could be instantaneously and completely rebuilt from the ground up using the least-cost, most-efficient technologies currently available given current input prices and then operated in the least cost most efficient manner, subject only to the constraint that the new network design must take as given the existing wire center locations. In a recent Notice of Proposed Rulemaking ("NPRM"),[6] the Commission has raised the issue of whether it should make any changes to its rules for pricing UNEs and, in particular, has raised the issue of whether the instructions it

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3 Costs are typically allocated across periods through choice of a depreciation schedule and rate of return that then generate the appropriate costs to assign to each period.

4 In this paper we will not explicitly analyze the issue of how cost allocation rules should be chosen. However, we note one of our main conclusions – that the regulatory process must constrain the discretion of regulators to set below-cost prices – also is relevant to this issue. In particular, since the choices of a rate of return and asset lives can significantly affect price levels, the framework that the Commission provides state regulators should provide as much objective guidance as possible on how these can be accurately and objectively calculated.

5 As we will discuss in more detail in the paper, the actual language the Commission uses to describe the TELRIC standard is arguably vague enough to allow states some leeway in choosing how to implement it. We are describing the standard the way it is generally implemented.

6 *In the Matter of Review of the Commission's Rules Regarding the Pricing of Unbundled Network Elements and the Resale of Service by Incumbent Local Exchange Carriers, WC Docket No. 03-173*, Notice of Proposed Rulemaking, FCC 03-224, (September 15, 2003). (Hereafter, *TELRIC NPRM*.)

gives state regulators for choosing a hypothetical network design and calculating its costs should be altered in some fashion. The direction of the change it proposes is to require regulators to choose a design for the network that "is more firmly rooted in the real-world attributes of the existing network, rather than the speculative attributes of a purely hypothetical network."[7]

In this paper we will explain why economic theory supported by factual evidence strongly suggests that this would be a desirable policy and identify a particular methodology that we believe would best accomplish the goals the Commission desires to achieve. We believe that the main and fundamental defect of the current TELRIC methodology, from which other problems arise, is that it produces prices that do not fully compensate ILECs on a going forward basis either for the costs they will actually incur to produce UNEs, or any reasonable estimate of the theoretically efficient forward-looking costs that that ILECs would incur. We will say that TELRIC prices are below forward-looking costs to describe this property. The systematic under-pricing of UNEs leads in turn to a variety of social harms, the primary one being that as a matter of economic principle, a pricing policy that systematically fails to provide compensatory rates reduces the ILECs' incentives to invest in maintaining and upgrading their existing networks. At this point in time, when more than 10 percent of the loops supplied by ILECs are sold as UNEs to Competitive Local Exchange Carriers ("CLECs")[8], the magnitude of the dampening effect on investment may not yet even be fully apparent. However, so long as CLECs can purchase UNEs at prices well below the cost of producing them, we should expect the share of lines sold as UNEs to continue to increase dramatically, so that ultimately the ILEC's disincentive to invest – and indeed, threats to the ILEC's solvency itself – will grow much more severe unless proactive steps are taken now to change the rules. A further social harm caused by low TELRIC prices is that they distort CLECs' incentives to invest. Specifically, below-cost UNE prices create incentives for CLECs to purchase UNEs instead of building their own facilities, even if it would be more efficient for them to build their own facilities. Of course, the most robust form of competition,

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7 *TELRIC NPRM*, ¶4.

8 In this paper we will generally use the term CLEC to include all relevant competitors to local exchange incumbents, regardless of technology choice.

and competition that supports the elimination of all regulation, i.e., both wholesale and retail (the Act's overarching objective), ultimately requires facilities-based competition.

We believe that there are two main reasons that the TELRIC methodology tends to produce prices much too low to cover the actual forward-looking cost of ILECs to provide UNEs or any reasonable estimate of the theoretically efficient forward-looking cost of ILECs to provide UNEs. First, in the real world ILECs are constrained by a number of factors that the TELRIC methodology explicitly instructs regulators to ignore. For example, ILECs are largely constrained to use their existing routes for outside plant, due to the preexistence of rights of way, conduit, poles, and other support structures. Furthermore, ILECs cannot readily redesign the node structure of their distribution plant (that is, nodes beyond the central offices) to respond efficiently to the fact that population centers may be much denser than when the network was originally designed, that population centers may have shifted, or that demand patterns may have changed. Finally, in reality the ILEC does not have the opportunity instantaneously and simultaneously to reconstruct all parts of its network. Rather, the ILEC must change the technology it uses in its network incrementally. This means that the ILEC is often constrained by its existing network as to what new technologies it can adopt, or at least must incur extra costs to guarantee that new infrastructure is compatible with and can interoperate efficiently with its legacy infrastructure. Therefore, to the extent the TELRIC calculation instructs regulators to ignore important real characteristics of the ILEC's existing network that increase an ILEC's forward-looking cost, the TELRIC cost will simply be lower than the ILEC's actual forward-looking cost, even if there were a completely objectively verifiable way of calculating the hypothetical cost of a hypothetically efficient firm.

The second reason why the TELRIC methodology produces prices that are lower than the actual forward-looking cost of ILECs or any reasonable estimate of the theoretically efficient forward-looking cost of ILECs is the fact there is no completely objectively verifiable way of calculating the hypothetical cost of a hypothetically efficient firm. This is a material problem in light of the reality that state regulators have some short-term incentives to set UNE prices below the ILECs' costs of providing the UNEs. The TELRIC calculation is so hypothetical and unconstrained by any objective evidence, it allows state regulators considerable leeway to indulge these short-term incentives. In the short run, lowering UNE prices can result in immediate benefits to regulators because this may cause retail prices to decline and will encourage (UNE-based) entry. These outcomes, in turn, enable regulators to point to the increased levels of "competition," as well as the lower retail prices, that occurred under their watch. Of course, these "benefits" are financed by forcing ILECs to sell elements of their networks at non-compensatory rates. In the short run this is possible to the extent that ILECs have sunk assets that they cannot redeploy. However, in the long run ILECs will not invest to replace these assets, so not only does the policy impose tremendous inefficiencies over time as ILECs' networks diminish in quality and reliability, but it is not sustainable. The policy is not sustainable because as retail services are increasingly provided over UNEs, the maintenance, reinforcement, and replacement of network assets by ILECs will lose economic viability, and these investments, and then ILECs themselves, will inevitably fail to be self-sustaining.

Our observation that regulators who are pressured to show some benefits in the short term may face perverse incentives to engage in myopic expropriation is not new. It is a standard and accepted conclusion in economics that such short term regulatory incentives to confiscate assets are pervasive and important and that therefore a key principle for designing good regulatory institutions is to make sure that they require the regulator to credibly commit *not* to confiscate the regulated firm's assets.[9] Unlike other, more traditional regulatory mechanisms, such as rate-of-return regulation or price caps, the TELRIC rule that the Commission has chosen for state regulators to use fails this test.

Of course, establishing proper constraints on regulators is not the only objective of regulatory design. Another, thoroughly traditional concern of regulatory policy is the desire to encourage ILECs to operate efficiently. Some observers apparently believe that the use of TELRIC represents a major step forward in regulation because it provides a solution to the age-old problem that regulated firms may not have the incentive to reduce their costs to efficient levels when prices are based on their actual costs. The idea that TELRIC represents a solution to this concern, however, is based

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[9] See footnote 23.

on a profound misunderstanding of the nature of the regulatory problem. It has *always* been well recognized that a "solution" to the regulatory incentive problem would be to create an all-knowing regulator who can perfectly determine what it should cost to produce a product and then simply tell the firm that this is the price it is allowed to charge. The problem with this "solution" is that no one has yet figured out a way to produce an all-knowing regulator to perform this calculation! The heart of the regulatory problem is of course precisely the fact that regulators are not omniscient and do not have information sufficient to perfectly identify what the price should be. Therefore the "innovation" of TELRIC that it would use regulators to set prices equal to what they *should* be, is really no innovation at all but rather an exercise in wishful thinking. Certainly, to the extent that regulators can objectively determine that existing practices are inefficient to the point of being imprudent, regulators should be permitted to disallow these practices for the purposes of calculating forward-looking costs, much as regulators have the right to disallow imprudent expenditures under traditional cost-based regulation. However, the approach of simply deputizing regulators to lower prices without sufficient objective constraints simply causes the problem we are observing today: namely, regulators set prices below compensatory rates to achieve short-run benefits and this harms consumers and social welfare generally in the long run.

Furthermore, it is not clear that there are significant further efficiencies that could be squeezed out of ILECs by making the prices they receive for UNEs more independent of the actual costs that they are able to achieve. This is because UNEs constitute a relatively small share of ILECs' total sales. The large ILECs are virtually all subject to price cap regulation for most of their sales other than UNEs.[10] Price cap regulation provides high-powered incentives in the form of risks and rewards for efficient behavior. Moreover, the increasing intensity of the competitive threat from other facilities-based carriers provides additional incentives for efficiency.

All of the above factors lead us to conclude that the FLEC methodology proposed by SBC in this proceeding would be a desirable methodology for the Commission to adopt. Namely, we suggest that, for

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[10] Sales at the retail level are subject to price caps. Interstate access is regulated at the federal level under a price cap regime, and we understand that many states also regulate intrastate access under price caps.

purposes of calculating forward-looking cost, the Commission instruct regulators to choose a network design that is the actual network of the ILEC operated at the efficiency levels at which the ILEC currently operates its network, subject only to the following caveats (i) changes that are anticipated to be made in some reasonably short and predictable period may be included in the design and (ii) outmoded assets that are no longer commercially available may be replaced (in a modeling sense) by currently available functionally equivalent assets. As is true for any FLEC methodology, the regulators would estimate the cost of constructing this network given current input prices.

Even ignoring concerns of regulatory expropriation, we believe that calculating the cost of rebuilding the current network at current input prices, replacing obsolete equipment with functional equivalents that are available, and taking existing efficiency levels as given, can be viewed as providing a reasonably accurate estimate of the ILEC's actual forward-looking cost. This approach has the virtue of taking into account the facts that existing structures and rights of way constrain the ILEC's real choices, that long-lived assets cannot be instantaneously replaced every period, and that the ILEC is constrained in its future choices by choices it has made in the past. An economically sound pricing methodology must take into account efficiencies that are realistically achieved, not those that hypothetically could be achieved. However, in the real world in which carriers already have reasonable incentives to function efficiently and where regulators have predictable incentives to deviate from compensatory pricing when they are given the discretion to do so, the case for using the actual network design and the actual levels of efficiency that have been achieved is even stronger.

Finally, we wish to take note of a somewhat different approach than our own to analyzing the issue of how optimal UNE prices should be set that is often alluded to or discussed by supporters of the current methodology. We believe that our approach might be best characterized as the "reality-based" approach because we attempt to determine how prices should be set to promote efficiency given real constraints of the environment, such as the fact that ILECs cannot adjust their network design instantaneously, that existing structures constrain future route choices, and that idealized perfect competition is not possible for a variety of reasons such as economies of scale and sunk assets. We believe the other approach is best characterized as the "alternate universe" approach. This other approach begins by imagining the existence of a counter-factual world in which CLECs can instantaneously enter at full scale using the best available current technology so that a perfectly competitive market for UNEs would exist. The perfectly competitive UNE prices can be calculated in this alternate universe and proponents of this approach suggest that, since perfect competition produces efficient prices, we should set prices in the real world equal to the perfectly competitive prices that would exist in the alternate universe.

The obvious problem with this approach is that, while it certainly may be true that the perfectly competitive prices calculated for the alternate universe would be efficient and desirable prices in the alternate universe, it is far from clear why they would be desirable in the real world that differs markedly from this alternate universe. In the real world, the facts that assets are long lived and sunk have important implications which ought to affect real decisions and it is far from clear why the hypothetical prices that would exist in a world where these facts did not apply would provide appropriate signals in our world. Furthermore, we believe that the alternate universe approach is logically inconsistent and incompletely thought out in any event. If CLECs could in fact enter instantaneously and costlessly at full scale, it is likely that many other features of the environment would differ too, and these also ought to be taken into account in any correct analysis of the alternate universe. For example, economic asset lives would be extremely short, and depreciation rates and the cost of capital would have to reflect these facts. Similarly, customer churn might be very high, and the treatment of non-recurring costs would have to respond accordingly. Neither of these issues is typically considered by proponents of the alternate universe approach. Of course, we do not think that the correct way to approach these inconsistencies is to further refine the analysis of the alternate universe. Rather the solution is to explicitly analyze the real world as it exists.

The remainder of this paper is organized as follows. In Section 2 we explain why prices that fully compensate ILECs for their actual forward-looking costs of producing UNEs will accomplish the goals that the Commission has indicated it wishes to accomplish through its choice of a UNE pricing methodology. In Section 3 we describe in more detail the two main reasons why the TELRIC methodology produces prices that do not compensate ILECs for their forward-looking costs of providing UNEs. These are that: (i) TELRIC calculations ignore real world factors that actually increase ILECs' forward-looking costs, and (ii) TELRIC calculations are so hypothetical that they do not adequately constrain regulators to set compensatory rates, and therefore allow them to succumb to short term incentives to expropriate sunk assets. In Section 4 we review some statistical evidence that suggests that UNE prices are both too low and that they vary widely between states in ways that cannot be explained by likely cost drivers. This latter fact suggests that TELRIC rules do in fact give state commissions considerable discretion to set TELRIC prices at levels that differ from costs. In Section 5 we consider the issue of incentives for cost minimization and point out that high-powered incentives for cost minimization are already created by the fact that the vast bulk of ILEC sales (retail and wholesale) are subject to price caps. In Section 6 we describe the pricing methodology that we suggest the Commission should adopt and explain why we believe that it provides a reasonably accurate measure of the ILEC's actual forward-looking costs of producing UNEs, while simultaneously constraining the discretion of regulators to arbitrarily reduce prices below costs. Section 7 draws a brief conclusion.

2. The Commission can best accomplish its stated goals by setting UNE prices so that they provide ILECs with an opportunity to recover their forward-looking costs

2.1. Introduction

The Commission clearly states that it has two primary goals in mind when it considers the choice of a UNE pricing methodology – providing ILECs with an opportunity to recover their forward-looking costs of producing UNEs so that ILECs will be willing to invest in the assets necessary to provide UNEs, and providing CLECs with efficient entry and investment signals.

> In the *Local Competition Order*, the Commission found that a UNE pricing regime should achieve two objectives. First, UNE prices should be set in a manner that sends efficient entry and investment signals to all competitors. Second, UNE prices should provide incumbent LECs an opportunity to recover the forward-looking costs of providing UNEs. [11]

We begin our discussion of the goals of a UNE pricing policy in Section 2.2 by explaining in more detail why the goal of providing appropriate incentives for ILEC investment is important. Then, in Section 2.3, we turn to the second goal of creating appropriate incentives for CLEC investment and entry. In principle, achieving the second goal might conflict with achieving the first goal, in which case some sort of analysis of the trade-offs between achieving these two goals would be necessary. We interpret the Commission as referring to this potential conflict when it states that determining whether or not UNE prices have been set "correctly" is a complicated task.

> Because the Commission designed UNE prices to serve two distinct objectives – providing appropriate economic signals with respect to efficient competitive entry and

[11] *TELRIC NPRM*, ¶38. (Footnote omitted.)

> investment while providing incumbent LECs with the opportunity to recover the forward-looking costs of providing UNEs – determining whether UNE prices for a given carrier in a given state have been set at the 'correct' level is an extremely complicated task.[12]

The point we make in Section 2.3 is that we believe that fairly straightforward economic reasoning suggests that the best policy for the Commission to follow to achieve its second goal is also to set UNE prices so that they fully accomplish the goal of providing ILECs with an opportunity to recover their forward-looking costs of providing UNEs. This is true for two related reasons. First, by setting prices at a level that allows ILECs to recover their forward-looking costs of providing UNEs, the Commission will also simultaneously guarantee that UNE prices provide the correct signal for an important investment decision of competitors. This is competitors' "make-or-buy decision," i.e., the decision whether to enter by purchasing UNEs from the ILEC, or by investing in their own facilities. Second, if the Commission were to determine that it wished to further stimulate the aggregate amount of competitive entry (a policy goal which we are not endorsing), we believe that the appropriate and sensible policy to do so would be to provide some type of subsidy to *all* competitive entrants (including those using their own facilities), so as not to distort the competitors' make-or-buy decisions.

2.2. Incentives for ILEC Investment

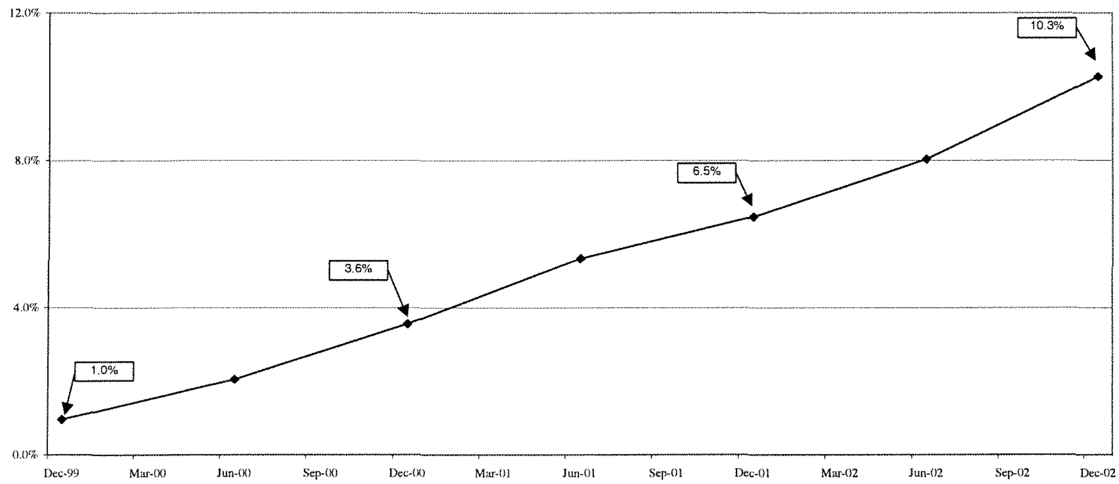
The pricing regime must provide the ILEC with a credible promise that it will be reimbursed for the forward-looking costs it will actually incur to produce future output, or the ILEC will not invest and, ultimately, will go out of business. One could argue that ILECs need not recover their costs of UNEs, because UNEs constitute a small percentage of the ILECs' networks, and therefore the effect of any failure to recover costs will (allegedly) have minimal effect on the LECs' incentive or ability to invest or, in fact, its solvency. This argument fails for several reasons.

First, even if investment incentives would not be significantly affected by the current level of UNE sales, so long as CLECs can purchase UNEs

[12] *TELRIC NPRM*, ¶39.

at prices well below the cost of producing them, we should expect the share of lines sold as UNEs to continue to increase dramatically, so that ultimately the ILEC's disincentive to invest – and indeed, threats to the ILEC's solvency itself – will grow much more severe unless proactive steps are taken now to change the rules. That is, the reason that unremunerative UNE prices damage incentives to invest is not primarily due to their effect on current overall cash flows (though these may be substantial), but due to the expectation that UNEs will continue to grow, siphoning greater numbers of customers away from the incumbent's retail operation. According to FCC data, there were approximately 14 million CLEC lines provided over incumbent facilities as of the end of 2002.[13] Figure 1 below shows that the penetration of CLECs using ILEC lines (UNE-L and UNE-P) has risen rapidly since 1999, and the share of ILEC lines sold as UNEs now tops 10 percent nationwide. It is undoubtedly the potential continued growth rate, in addition to the current level, of UNE penetration at below-cost prices that harms ILEC incentives.

Figure 1:
Total UNE-L and UNE-P Share of RBOC Lines in the US



Source: www.fcc.gov/wcb/iatd/comp.html

13 "Selected RBOC Local Telephone Data" downloaded from www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/RBOC_Local_Telephone_Dec_2002.xls on December 15, 2003.

Moreover, it is well recognized that CLECs seek to attract the most profitable ILEC customers. For example according to analysts at Banc of America Securities:

> AT&T's approach to launching local service has been very granular. AT&T's "cherry picking" approach has drawn Bell ire but it has worked. The company targets expansion by state, by neighborhood, and by profit hurdle, experiencing substantial success in the process.[14]

AT&T has admitted as much itself. At a recent investors conference AT&T Chairman and CEO David W. Dorman stated:

> We continue to take a targeted approach to attract and retain high-value customers to our bundled services offerings, allowing us to drive profitability in this area of our business.[15]

Therefore the percentage reduction in ILEC revenues created by even the current level of UNE sales is likely much more significant than the percentage of ILEC lines that have been lost to UNEs.

As long as prices remain below cost, ILECs face the prospect of an ever-increasing market share of CLECs using ILEC facilities, compounding the damage by cherry-picking the most profitable customers. This prospect can only damage incentives to invest, and the harmful effects on incentives will only accelerate unless the Commission uses the opportunity of this proceeding to indicate that it intends to reverse the current practice of requiring ILECs to sell UNEs at below-cost prices.

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[14] David W. Barden, "AT&T Corporation: A Case for Consumer Services," Banc of America Securities—United States Equity Research, April 30, 2003, p. 6.

[15] AT&T Press Release, "AT&T Chairman Outlines Aggressive Competitive Strategy at SCFB Conference," (December 11, 2003). Downloaded from http://biz.yahoo.com/prnews/031211/nyth130_1.html (quoting AT&T Chairman and CEO David W. Dorman) on December 15, 2003.

2.3. Incentives for CLEC Investment and Entry

As noted above, we will make two points in this section – (i) that setting UNE prices so that they cover the ILEC's forward-looking costs creates incentives for CLECs to make efficient investment decisions, and (ii) that the economically rational way for the Commission to induce further entry of CLECs, if this was thought to be desirable, would *not* be to lower UNE prices, but would instead be to provide a distortion-free, explicit subsidy to all CLECs. We will elaborate on each point in turn.

The first point—that setting UNE prices so that they cover the ILEC's forward-looking costs creates incentives for CLECs to make efficient make-or-buy decisions—is straightforward.[16] When the CLEC decides whether to purchase a UNE or provision the network element itself, it compares the prices it will be charged for the UNE with its own forward-looking costs of providing the element. The CLEC's decision to purchase a given element rather than build the facilities to produce this element itself is efficient if and only if the CLEC's net benefits from building, and incurring its forward-looking costs to do so, exceed its net benefits from purchasing the ILEC's facilities, taking into account the ILEC's full forward-looking cost of providing those facilities. It follows immediately that the CLEC will make an efficient make-or-buy decision so long as the ILEC charges prices that just cover its own forward-looking costs (including the cost of capital) of providing the UNE.

The second point is that the Commission should not lower UNE prices below this level even if it determines that it wants to stimulate more aggregate CLEC entry; the Commission should instead use another policy instrument to provide a subsidy that is available to *all* CLECs. This point is slightly subtler. Suppose that the Commission decided that it wished to stimulate greater amounts of CLEC entry than would occur when UNE prices are set equal to ILECs' forward-looking costs of providing UNEs. Suppose further that it decided to address this problem by lowering UNE

16 We note that the efficiency question we interpret the Commission as addressing concerns how prices should be set for an element given that the Commission has decided to require that the element be made available as a UNE. The question of whether or not an element should be made available as a UNE is a separate question. In particular, in workably competitive markets, there is not generally perceived to be a need for government regulations that require incumbents to sell their output at regulated prices to potential entrants.

prices. The problem with such a policy would be that, although more entry of CLECs would likely result, the type of CLEC entry would be inefficiently distorted towards UNE based entry. Because such a policy distorts the make-or-buy decision, it is likely that CLECs that otherwise would have entered using their own facilities will instead decide to enter using UNEs.

The essential problem with using below-cost UNE prices to subsidize CLEC entry is that it amounts to a program where the Commission offers to subsidize CLEC entry *only if* the CLEC agrees to purchase UNEs from the ILEC but *not if* the CLEC wants to build its own facilities. In light of the FCC Chairman's own conclusions that facilities-based entry will ultimately provide more robust and desirable competition than UNE based entry,[17] adopting a subsidy policy that biases CLECs' decisions away from facilities-based entry and towards UNE-based entry strikes us as being a particularly perverse policy.

The obvious solution to this conundrum is to use the policy instrument of UNE prices to provide efficient incentives for the make-or-buy decision and to use some form of direct subsidy available to *all* entrants (not just those that agree to purchase UNEs from the ILEC, and not just those using traditional wireline technology) if further competitive entry was thought to be desirable. From a political perspective this economic policy has the same sort of cost that many sensible economic policies seem to have in the telecommunications sector. Namely, it would require replacing an implicit tax used to fund an implicit subsidy with an explicit tax used to fund an explicit subsidy. Under the current policy, an implicit tax on ILECs (requiring ILECs to sell UNEs at below-cost prices) is used to fund an implicit subsidy to UNE-based CLECs (allowing CLECs to purchase UNEs at below-cost prices). If the Commission determined that it wished to continue to subsidize competitive entry, the more economically rational policy for achieving the avowed goal (again, not endorsing the wisdom, desirability, or legality of the goal) would be for the Commission to use an explicit tax (presumably leveled on all telecom carriers or consumers or even more broadly) to fund an explicit subsidy (that was available to

[17] Remarks of Michael K. Powell, Chairman of the Federal Communications Commission, at the Goldman Sachs Communicopia XI Conference New York, NY October 2, 2002 (as prepared for delivery).

CLECs that enter using their own facilities as well as to CLECs that enter using UNEs).

Furthermore, to the extent that the Commission may have once desired to subsidize entry, it appears to be shifting away from that philosophy. The Commission seems to suggest that as levels of competition have grown since the passage of the Act, its attention has shifted from stimulating entry to ensuring efficient investment.

> Our concerns in evaluating the TELRIC pricing rules are somewhat different than those present at the time the Commission adopted its *Local Competition Order*. At that time, local competition was largely a theoretical exercise and we placed a premium on the need to stimulate entry into the local exchange market. . . . Today, now that competition has taken root in many areas of the country, we initiate this proceeding to consider whether our pricing methodology is working as intended and, in particular, whether it is conducive to efficient facilities investment.[18]

Therefore given the Commission's own shift in emphasis away from subsidizing entry and towards creating efficient investment incentives, we think that this would be a particularly appropriate time for the Commission to choose a UNE pricing rule that creates efficient investment incentives and eliminates implicit subsidies.

2.4. Conclusion

In this section we have explained why there is no conflict between the Commission's two goals of (i) providing appropriate incentives for ILECs to invest and (ii) providing appropriate incentives for CLECs to invest and enter. Namely, each of these goals is best accomplished by a policy of setting UNE prices so that they cover ILECs' forward-looking costs.

18 *TELRIC NPRM*, ¶¶2-3.

3. Why TELRIC prices are "too low"

We believe that there are two fundamental reasons why, in practice, TELRIC produces prices that are too low. First, the TELRIC methodology arguably instructs regulators to predict what a carrier's costs "should" be if the carrier were perfectly efficient with no legacy constraints other than its wire center locations. If regulators could indeed omnisciently identify such costs, however, they would not be the costs that an efficient ILEC with a legacy network could in fact achieve, because of the real constraints imposed by the network in place. Second, however, is the separate fact that regulators do not have an unbiased incentive to predict what those costs would be, even if they were able to do so. Regulators themselves have incentives that must be recognized and managed by the regulatory mechanism. We discuss these issues separately in the next sections.

3.1. TELRIC ignores real costs that are not inefficiencies

The TELRIC methodology has been interpreted to require that the cost estimates for UNEs reflect the costs of a hypothetically efficient carrier, not the "efficient" forward-looking costs of the ILEC itself. That is, one could distinguish between, on the one hand, the costs that a carrier entirely unconstrained by the legacy network of the incumbent other than its wire center locations "should" be able to achieve; and the cost that, on the other hand, the ILEC itself "should" be able to achieve going forward if it implements the best available technology efficiently given the real constraints of its existing network. We will refer to the former assumption as the "clean slate" approach, though we recognize that the FCC's clean slate approach requires holding the locations of the existing wire centers fixed. The FCC has expressed some ambivalence about this distinction, so that the FCC's guidance is not entirely clear. For example, the FCC has acknowledged that ILECs should be able to recover costs of reconditioning loops, even though these costs would not be incurred by a hypothetically efficient carrier that is unconstrained by the ILEC's past.[19]

[19] *In the Matter of Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, CC Docket No. 96-98*, Third Report and Order and Fourth Further Notice of Proposed Rulemaking, (November 5, 1999), FCC 99-238, pp. 90-91. (Hereafter, *UNE Remand Order*.)

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Nevertheless, in our experience, state commissions have tended to interpret the FCC's direction as permitting a policy in which costs that the ILEC would incur, acting efficiently, are not allowed if they would not be incurred by a "clean slate" carrier. This interpretation (or requirement, depending on one's view) has the effect of understating costs relative to cost levels that can be achieved by a real, albeit fully efficient, ILEC.

Even if the regulator could identify in a perfect and unbiased manner the costs that "should" be achievable by a clean slate carrier (and we believe that regulators could not and would not do so, as discussed in Section 3.2) such costs would not be achievable by a real ILEC and therefore are inappropriately low. Costs that could be achieved by the most efficient real-world ILEC are constrained by the network that it has in place, and by the characteristics of the neighborhoods, towns, and cities in which the network is placed.

We will now provide some examples of real costs that an ILEC with a legacy infrastructure must incur, but which a "blank slate" hypothetical entrant can avoid.

First, some TELRIC models ignore the fact that existing structures place severe constraints on where a real carrier can place its outside plant. TELRIC models often redesign the routes of outside plant to satisfy an algorithm that supposedly minimizes cost, but then fail to incorporate the fact that placing plant along new routes may result in significant new costs due to man made or natural impediments.[20] Moreover, the cost of placing cable along these routes may not incorporate the costs of digging up and replacing existing streets and landscaping, which are costs that would be incurred by an efficient carrier in the real world if it attempted to adopt the network structure assumed in the model. As another example, although the FCC rules require maintaining the existing placement of "nodes," nodes are typically interpreted narrowly as wire centers only. Other network interfaces or network interconnection points, such as Serving

[20] Reply Declaration of Ian McNeill, filed on behalf of SBC California, U-502-C, Before the California Public Utility Commission, Application 01-02-024, *et seq.*, February 7, 2003, ¶15. See also Timothy J. Tardiff, "Pricing Unbundled Network Elements and the FCC's TELRIC Rule: Economic and Modeling Issues," *Review of Network Economics*, Vol. 1, Issue 2 (September 2002), p. 140. (Hereafter, *Tardiff 2002*.)

Area Interfaces (SAIs), are typically not considered nodes in some TELRIC models. It is common that CLECs will advocate, and commissions will accept, the premise that the design and placement of outside plant is open to clean slate design. With respect to SAIs, for example, one common modeling approach is to "place" SAIs in the exact center of a serving area in order to minimize the length of plant needed to serve the customer locations in the area. What such models fail to recognize is that real engineering practice must take into account the fact that the center of an SAI's serving area is likely to be in someone's swimming pool or living room, and that a location that is more accessible to engineers and technicians may commonly be at the edge of the serving area, which is where real network engineering practices will place them. The edge of a serving area may typically be a large street or thoroughfare, so that engineers can access the equipment efficiently. The fact that the practical considerations that drive real engineering practices are ignored results in costs that could not be achieved by a real carrier.

Second, TELRIC models generally assume that the ILEC can costlessly readjust the node structure and other aspects of its outside plant (that is, nodes beyond the central offices) to respond efficiently to the fact that population may be much denser than when the network was originally designed, that population centers may have shifted, or that demand patterns may have changed, even though in reality such changes to existing outside plant can be enormously expensive. A classic example of the problem this creates concerns areas that have grown more densely populated over time. The network exhibited by a perfectly efficient ILEC that has always served such an area and that has adapted its network in perfectly efficient ways as population has grown more dense may have very different SAI locations and generally appear to be less efficient than the theoretically ideal network that would be constructed from the ground up to serve the area given its current high population density. The problem with the TELRIC approach is that it simply ignores the fact that even a perfectly efficient ILEC cannot costlessly redesign its outside plant. For example an economist who has participated in a number of TELRIC proceedings reports a case where a TELRIC model predicted that a hypothetically efficient carrier would be able to halve its costs as population density doubled over a period of six years. However, closer inspection revealed that the hypothetically efficient carrier at the end of the six-year period used completely different routes than the hypothetically efficient carrier at the beginning of the six-year period. In particular the network of the efficient carrier at the end of the six-year period exhibited approximately twice as many service areas as the efficient carrier at the beginning of the six-year period, implying that the initial cable routes became obsolete as demand grew and the hypothetical carrier found more "efficient" paths to the customers. No real ILEC could respond in this way to an increase in population density.[21]

Third, since the ILEC is not able to replace its entire plant at once, but instead does so incrementally over time, the ILEC (and any other existing carrier) is necessarily much more constrained in its ability to adopt new technology than is a hypothetical clean slate entrant. To the extent that existing facilities are rebuilt over time through ongoing upgrades and reinforcements, it is necessarily the case that the ILEC is constrained to rebuild its plant using technology that is compatible with the legacy plant. An example of the phenomenon that the ILEC's ability and opportunity to adopt new technology may be much more constrained than that of a hypothetical clean slate entrant concerns the adoption of a digital loop carrier technology that uses a new and less costly interface referred to as "GR303." Our understanding is that for ILECs to adopt this technology would require a costly, large-scale upgrade of switching technology, and thus would be uneconomic. Nonetheless, TELRIC cost studies often assume that the hypothetical entrant is able to use this lower cost technology (because there is no existing legacy switching capacity with which it must insure compatibility).[22]

Even when new technology can interoperate with legacy technology so the ILEC can adopt it, the costs of implementing the interoperability may be substantial. It is often cheaper to operate a firm with a single vintage and type of equipment, insofar as training of equipment operators and maintenance personnel can be streamlined, volume discounts may be deeper, and interoperability issues are minimized. While the hypothetical

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21 *Tardiff 2002*, p. 142.

22 *Tardiff 2002*, p. 141, footnote 32. Tardiff reports that there are also other potential problems with this new technology so that it may not always actually be the most efficient technology even when switch compatibility is not an issue. In particular, it may be difficult or costly to provide unbundled loops. This issue will be discussed further in Section 3.2 because it provides an example of opportunistic behavior on the part of regulatory commissions.

blank slate carrier of TELRIC can avoid such costs by installing a single vintage or type of equipment, real carriers that build and upgrade their plant over time cannot. Hence, the costs of making the assets work together seamlessly, training personnel on multiple types of equipment, negotiating with multiple vendors, and so forth cause costs that are inherent to an efficient network operation.

3.2. The hypothetical nature of the TELRIC calculation does not sufficiently constrain regulators to set compensatory prices

An important attribute of the FCC's UNE pricing guidelines that explains the under-recovery of actual UNE costs is their reliance on hypothesis. In particular, by adopting guidelines that instruct the state regulator to estimate the network element costs of a hypothetically perfectly efficient carrier, employing the latest equipment and optimal network design from the nodes up, the FCC has in effect operationalized a process that is rooted in speculation and guesswork. The FCC's TELRIC principles frustrate (if not preclude) a useful comparison of the regulator-selected UNE price to real or verifiable cost data. This ambiguity acts to remove an effective check on the regulator's behavior. This is particularly perilous as a regulatory policy because regulators have well-understood short-run incentives to artificially lower prices and expropriate the ILEC's sunk assets.

The problem is that once a firm has invested in long-lived sunk assets that cannot be easily redeployed to another use, the regulator can lower prices well below compensatory rates without any apparent ill effects in the short run. A regulated firm that is not being paid prices that compensate it for the costs of its capital investments will refuse to undertake new investments; but the ill effects of this underinvestment will become apparent only in the longer run as old assets begin to wear out or become obsolete. Thus, regulators faced with pressures to show some short-term benefits will face perverse incentives to reduce prices in the short run even though this will ultimately create significant inefficiencies and harm to consumers and the economy. It is a well accepted principle of regulatory economics that that such short-term regulatory incentives to confiscate assets are pervasive and important and that therefore a key principle for designing good regulatory institutions is to make sure that they require the regulator to credibly commit *not* to confiscate the regulated firm's assets. The Commission has violated this cardinal rule of regulatory design by authorizing regulatory commissions to engage in highly speculative calculations about hypothetical costs, which cannot be (or, at least, are not required to be and therefore have not been) reined in by objectively verifiable data on actual costs.

There is a very large economics literature on this subject.[23] A nice summary of this idea is presented by economists Brian Levy and Pablo Spiller in a paper published in the *Journal of Law Economics and Organization.* The authors conduct a comparative study of the extent to which regulators are required to credibly commit not to expropriate assets across a range of different countries:

> Economies of scale and scope and highly specific assets imply that the number of providers of basic utility services is going to be relatively small. Because a large proportion of the utilities' assets are sunk, a utility will be willing to operate even if it cannot recover its sunk investments as long as it covers its operating costs. Widespread domestic consumption implies that the pricing of utilities is always going to be political. . . The combination of significant investments in durable, specific assets with the high level of politicization of utilities has the following result: utilities are highly vulnerable to administrative expropriation of their vast quasi-rents. Administrative expropriation may take several forms. . . [T]he easiest form of administrative expropriation is the setting of prices below long-run average costs. . . Where the threat of

23 In addition to the references that are quoted below, see for example, J. Gregory Sidak and Daniel Spulber, *Deregulatory Takings and the Regulatory Contract*, (Cambridge: Cambridge University Press, 1997): Richard J. Gilbert and David M. Newbery, "The Dynamic Efficiency of Regulatory Constitutions," *RAND Journal of Economics*, Vol. 25, No. 4 (Winter 1994); Thomas P. Lyon and John W. Mayo, "Regulatory Opportunism and Investment Behavior: Evidence from the U.S. Electric Utility Industry," (unpublished working paper, June 2000); Oliver E. Williamson, "Franchise Bidding for Natural Monopolies – In General and With Respect to CATV," *Bell Journal of Economics*, Vol. 7, No. 1 (Spring 1976); and Paul L. Joskow and Richard Schmalensee, "Incentive Regulation for Electric Utilities," *Yale Journal on Regulation*, Vol. 4, (1986).

> administrative expropriation is great, private investors will limit their exposure.[24]

Noted British economist David Newbery devotes an entire chapter of his recent book on regulation to explaining this issue. Speaking of the investors in a privately owned utility he states:

> If these investors are to be induced to invest, they need the reassurance that future prices will be set at a sufficiently remunerative level to justify the investment. Once the capital has been sunk, the risk is that the balance of advantage will shift toward those arguing for lower and possibly unremunerative prices.[25]

In his article in The New Palgrave Dictionary of Economics and Law entitled Rate-of-Return Regulation versus Price Regulation for Public Utilities, Newbery states:

> The central problem of regulation is to agree to a regulatory compact which reassures investors that their sunk capital will be adequately rewarded, and they will be protected from populist pressure to reduce prices to avoidable cost.[26]

We will now provide some examples that illustrate the point that deputizing regulators to decide what it "should" cost to produce UNEs has resulted, in some cases, in regulators making very unrealistic assumptions about what would be efficient or possible. One pattern that will emerge repeatedly is that regulators accept models that invoke apparent cost

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24 Brian Levy and Pablo T. Spiller, "The Institutional Foundations of Regulatory Commitment: A Comparative Analysis of Telecommunications Regimes," *Journal of Law, Economics and Organization*, Vol. 10, No. 2 (1994), p. 204. (Footnotes omitted.)

25 David M. Newbery, *Privatization, Restructuring, and Regulation of Network Industries*, (Cambridge, MA: MIT Press, 1999). See chapter 3 entitled "The Problem of Regulatory Commitment," p. 29.

26 David M. Newbery, "Rate-of-Return Regulation Versus Price Regulation for Public Utilities," in *The New Palgrave Dictionary of Economics and the Law*, (London: MacMillan, 1998).

saving features without also incorporating the additional long run costs that these features cause.

First, is the case of outside plant fill factors. A fill factor is the proportion of a facility's capacity that is in use, rather than spare capacity, at a point in time. Firms generally carry spare capacity, which means that their plant is not running "flat out" at all periods of time. In a telecommunications network, it means that there are more lines available for service, at a point in time, than there are lines being subscribed to. In the abstract world of TELRIC cost modeling, higher utilization rates translate into lower average costs because the cost numerator is divided by a higher divisor of usage. Therefore, in many cases regulators have found irresistible the temptation simply to increase fill factors in order to lower calculated costs. What they have failed to take into account is that, in the real world, spare capacity is a legitimate cost that is driven in part by economic tradeoffs, and that it saves other resources and eliminates other costs. That is, increasing fill factors would increase costs of the network in many other ways, and regulators typically adopt hypothetical TELRIC calculations that increase fill factors but do not take these offsetting costs into account.

Spare capacity in a network results fundamentally from the fact that telephone plant capacity is largely sunk, involves installation costs that are significant and largely fixed with respect to the capacity of the plant, and geographically non-fungible. Plant installed in one neighborhood is not usable in another neighborhood. Moreover, it would be unduly costly to install additional telephone cables overnight at new locations each time a new cable is called for (and perhaps opening up a street or digging up a yard each time). The placement of new plant involves such tasks as siting, obtaining of permits, trenching (or placing of utility poles), and other construction activities. Without sufficient spare capacity some of these costs would have to be incurred again and again every time new plant is called for in a particular location. It is often more efficient and less costly to open up the street once and lay cables that may go partly (or even wholly) unused for significant periods of time than to do so each time new demand requirements must be met.[27]

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[27] *Ginder Direct*, pp. 6-7.

Hence, efficient firms deploy and maintain spare capacity in order to accommodate both anticipated growth and uncertainty about demand. It is efficient to install spare capacity for growth because failure to do so would result in unduly high costs of frequent capacity reinforcement. It will also inevitably result in delay to customers, when customers demand service and capacity is not available to provide it. In most cases it is unacceptable under current quality service standards which ILECs must meet (subject to penalties) for ILECs to ask customers to wait days or months for additional capacity to be installed before a line order can be filled. In addition, it is entirely unrealistic to suppose that a real-world firm will know with 100 percent certainty what its actual future demand will be in the aggregate or in any particular geographic area, and this uncertainty will only increase as competition increases. Hence, suppose that the carrier expects that overall demand next year will grow by 2 percent. When planning for 2 percent demand growth, the firm must account for the possibility that demand (either for additional lines for existing users of because of growth) will exceed that estimate. It could account for that uncertainty either by planning to augment plant quickly, at the associated cost, if capacity runs out; or by installing extra spare capacity to account for the possibility of greater-than-expected growth. Both solutions cause costs, and an efficient firm will choose the one inducing the least expected cost given the variability of growth. What is not acceptable is to assume that the firm does not install additional spare capacity to account for uncertainty, but fail to take into account the potential additional installation costs over time that will thereby be incurred.

This opportunistic approach to the application of fill factors is in fact an example of a more general defect in the application of TELRIC models. TELRIC models are often designed as if demand is perfectly predictable and known. For example, if a neighborhood contains a newly built and unoccupied office building, a typical TELRIC model might not provide loops to those offices. In the real network, however, the distribution plant is designed to satisfy "ultimate" demand, which means in practice that, inter alia, an ILEC would install plant to that building and sufficient loop capacity to serve it when it is full. Of course, the impact of vacant office buildings is likely to be small, but the impact of the difference between serving existing demand and building to serve the ultimate demand that is anticipated in an area taking into account all reasonable sources of future demand can be substantial. The effect of this difference is not only on fill factors (the unused plant serving the empty office building would be "spare" in the short run in a real network and would therefore decrease the fill factor), but on other costs as well. For example, if feeder plant is designed to serve a smaller customer base, the model will assume smaller feeder cable plant, and the model will thereby incorporate insufficient facilities to provide sufficient service in the real world. These assumptions are unrealistic because they fail to recognize and incorporate the long run costs of having insufficient capacity in the future, and having to replace the existing equipment with more capacity. If, in a few years, the customer base has grown, the new models will typically incorporate the larger network necessary to serve it, but never do the models reflect the fact that providing the additional capacity would have required significant and costly modifications to the existing network.

We understand that the largest single driver of insufficient UNE rates may be due to this short run perspective that drives down the realistic amount of plant needed to provide service to customers. For example, testimony in SBC's recent UNE pricing case in California showed that the TELRIC model advanced by the CLECs implied that the entire SBC market in California could be served by a network that would cost $9 billion to construct.[28] In fact, public records showed that SBC California spent well over $9 billion from 1997-2001, simply reinforcing and augmenting the existing network.[29]

<u>Second</u>, is an issue regarding the type of technology used in digital loop carriers. There are two broad classes of digital loop carrier technology that are available – universal digital loop carrier (UDLC), which is an older, more expensive technology, and integrated digital loop carrier (IDLC), which is a newer and, all other things being equal, less costly technology.[30] The problem with IDLC, however, is that this

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[28] Reply Declaration of Dr. Timothy Tardiff, filed on behalf of SBC California, U-502-C, Before the California Public Utility Commission, Application 01-02-024, *et seq.*, February 7, 2003, p. 26. (Hereafter, *Tardiff 2003*.)

[29] *Tardiff 2003*, p. 26.

[30] Within the class of IDLC technologies there is an older version of IDLC usually referred to as TR008 and a newer version referred to as GR303. The GR303 technology is generally less expensive than the TR008 technology, which is in turn generally less expensive than the UDLC technology. We understand that it is not possible to cost effectively supply unbundled loops under either version of IDLC and therefore the problem being discussed in this section applies generally to all IDLC

technology is not currently capable of providing unbundled standalone loops without costly workarounds, including central office or fieldwork, the costs of which would clearly outweigh the savings of this technology.[31] Some TELRIC models have simply ignored this problem and adopted the assumption that the hypothetical network for which costs are estimated uses 100 percent IDLC, without considering the extra costs that would be required to provide unbundled loops if this technology were used. That is, they have estimated costs using the IDLC technology taking its lower cost into account, but not included the extra costs that would actually result from the provisioning of standalone loops. This is another example of regulators accepting models that invoke apparent cost saving features without also incorporating the additional costs that these features cause.

4. UNE prices are non-compensatory and appear to vary widely from state to state in ways that cannot be explained by plausible cost drivers

4.1. Introduction

In this section we present evidence that suggests that the problems we describe in the previous sections are causing UNE prices to vary significantly from the actual forward-looking costs of ILECs. In Section 4.2 we first compare UNE prices to prices that would be compensatory based on the historic book value of ILECs' networks, which is the only

technology. In the previous section we discussed the issue that using GR303 requires expensive updating of switching facilities so that, while using GR303 may be the cost-minimizing course of action for a "blank slate" carrier that was installing all-new switches, it would generally not be a cost-minimizing course of action for a real ILEC that has already invested in older switching technology. This issue only applies to the newer version of IDLC referred to as GR303. This is why we describe the problem discussed in the previous section as applying to the GR303 technology and the problem discussed in this section as applying to all IDLC technology.

31 *UNE Remand Order*, ¶217. In lay terms, IDLC is not capable of providing unbundled loops because IDLC is an "integrated" digital loop carrier technology, which means the loop is integrated directly into the incumbent's switch: to provide a "standalone" loop using such technology, the loop must somehow be "unintegrated." The same issue applies to the provision of non-switched services such as private lines, i.e., these cannot be provided in a cost-effective manner using IDLC technology either.

systematic, objective data on cost levels available. The actual UNE prices are dramatically lower than the prices that would compensate ILECs for their historic costs and in some cases do not even cover the ILECs' cash costs (even ignoring the need for ILECs to earn a return on their investments). In Section 4.3 we report the published academic results of two economists that determine how ILECs' true forward-looking costs are likely to vary from their historic costs and conclude that the results of Section 4.2 also strongly suggest that UNE prices are below ILECs' true forward-looking costs in many states. In Section 4.3 we take a somewhat different approach to documenting the magnitude of the problem. Instead of attempting to directly calculate the extent to which TELRIC prices are below cost, we examine the pattern of TELRIC prices across states. We find that TELRIC prices vary dramatically across states in ways that cannot be explained by any plausible cost drivers. This provides strong evidence that state commissions facing relatively similar cost conditions have nonetheless managed to determine that costs are dramatically different. This then demonstrates the TELRIC process gives states large amount of discretion to set UNE prices that are different from costs if they so desire.

4.2. Evidence that UNE Prices Are Below Booked Costs

In order to examine the relationship between booked costs and ordered UNE prices, we rely on the results that one of us has found in prior research.[32] In that research, it is demonstrated that UNE prices set by state commissions are below the prices that would be compensatory based on the historic book value of ILECs' networks not only in SBC's territory, but also throughout the U.S.

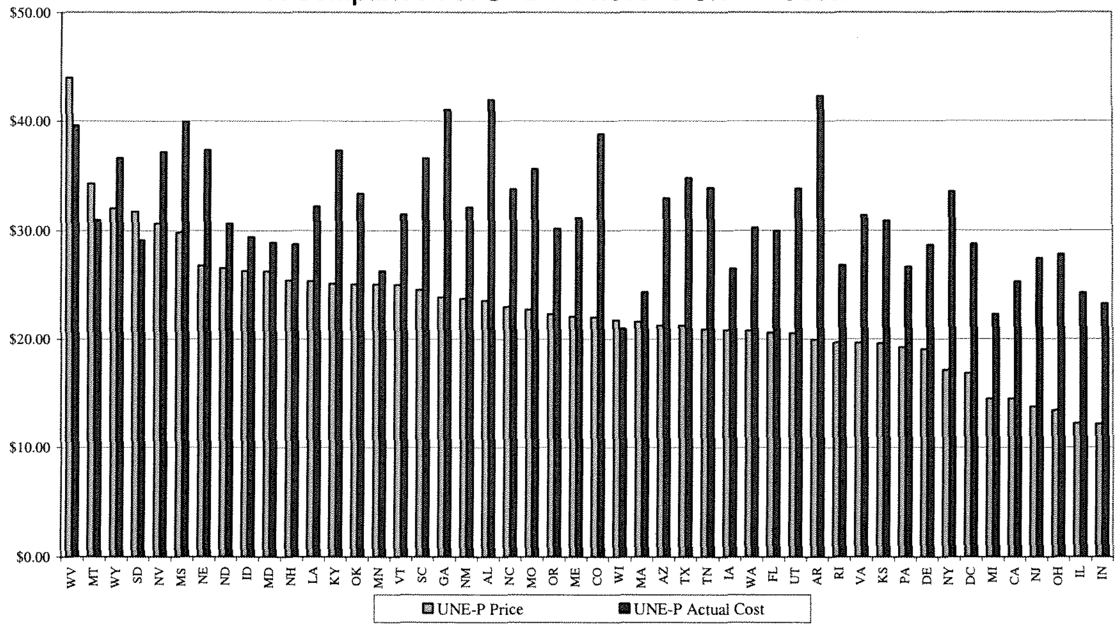
Figure 2 shows the prices for the UNE-P that are in effect as of November 2002, and the historical costs that the corresponding ILEC incurred as of December 2001 to furnish the corresponding elements. The UNE-P price for each state represents the weighted average UNE-P price across the rate zones in the state, including the loop, switching, usage, transport, and DUF recurring charges, and amortized non-recurring charges.

[32] Debra J. Aron, E. Gerry Keith, and Frank X. Pampush, "State Commissions Systematically Have Set UNE Prices Below Their Actual Costs," (LECG Working Paper, November 2003). (Hereafter, *Aron, Keith, and Pampush.*)

The analysis uses the FCC's financial accounting information as reported in its Automated Reporting Management Information System ("ARMIS") files to obtain the historical cost data. These data are reported to the FCC for purposes of tracking the interstate rate of return. The ARMIS data represent only the interstate allocation of the costs of regulated services, so the calculation "reverses out" the effects of that allocation to determine total line (UNE-P) costs. For example, the FCC attributes 25 percent of loop costs to the interstate jurisdiction, so the calculation estimates total loop costs by multiplying the interstate portion by 4.

The analysis also levelizes costs by considering depreciation expense (using the FCC's depreciation expense, and therefore the FCC's depreciation lives) and by applying a periodic return on invested capital (i.e., the FCC's assumed cost of capital of 11.25 percent) multiplied by average net investment. In addition, based on each state's avoided-cost resale discount, the analysis subtracts a portion of the loop-related expenses to account for costs that may be avoided when moving from retail to wholesale.

Figure 2:
A Comparison of UNE-P Prices to UNE-P Costs



Source: CCM November 2002 (Prices); and FCC ARMIS December 2001 (Costs), adjusted by LECG analysts to obtain total wholesale (UNE-P) expenses and investment.

As is clear from the figure, UNE prices set by state regulatory commissions are below the booked costs actually incurred by incumbent providers in 44 of the 48 states (and Washington D.C.) examined.[33] Moreover, the price-to-cost deficits in these 44 states are substantial in many instances. The research shows that, on average, UNE-P prices are about 64 percent of 2001 costs and that the average *deficit* between price and cost is about $10.74 per line per month. In only four states do UNE-P prices exceed UNE-P costs.[34]

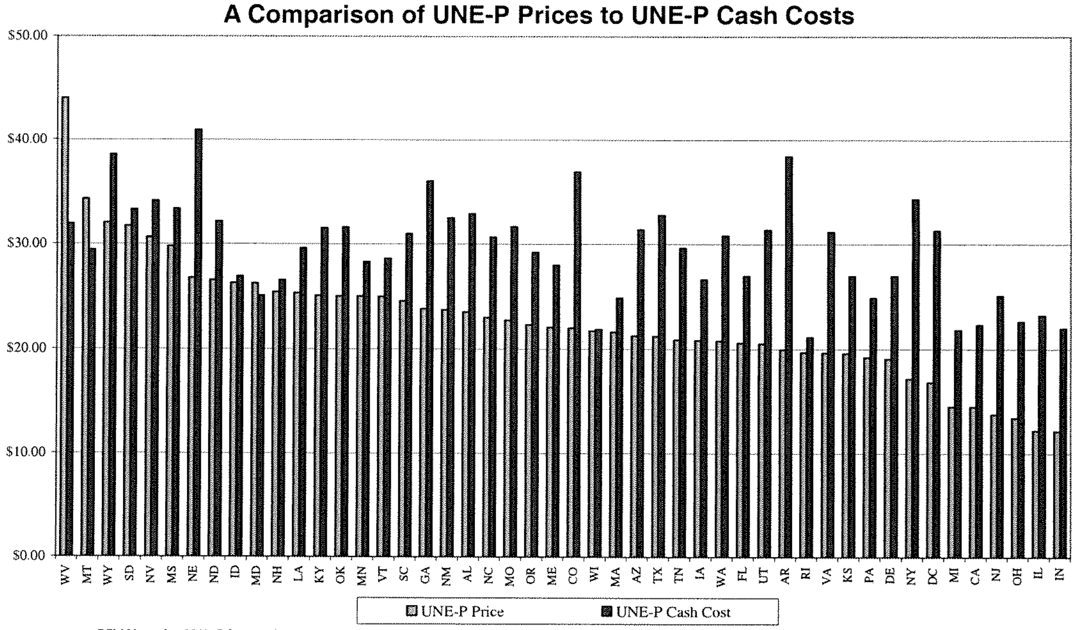
The cost figures in figure 2 are sensitive to the regulatory depreciation assumptions that are reflected in the ARMIS accounts. An alternative

33 Alaska, Hawaii, and Connecticut were not considered due to lack of UNE price data. UNE prices have further declined in some states since the date of the pricing survey used in this analysis, a fact that reinforces our point.

34 The 2001 costs incurred in West Virginia, Montana, South Dakota, and Wisconsin were less than the UNE prices estimated to be in effect during November 2002.

approach to evaluating whether prices are compensatory is to avoid the depreciation issues entirely and consider only cash costs. Figure 3 shows the prices for UNE-P as shown in figure 2, but compares them only to the ILEC's cash costs on POTS UNE-P as of December 2001. The cash costs include operating costs and cash capital expense, but exclude depreciation, interest, taxes, and a return to capital. As can be seen from figure 3, in all but three of the 48 states considered, UNE-P prices fail to cover ILEC cash costs. In other words, even taking this very partial view of costs, UNE prices currently in effect typically do not even compensate the ILEC for the cash opex and capex outlays it incurs.

Figure 3:
A Comparison of UNE-P Prices to UNE-P Cash Costs



Source: CCM November 2002 (Prices); and FCC ARMIS December 2001 (Costs).
adjusted by LECG analysts to obtain total wholesale (UNE-P) expenses and investment.

One may debate depreciation rates and returns on capital, but the fact that revenues fail to cover out-of-pocket cash expenditures should be a clear signal that a business model under which ILECs sell unbundled network elements at the currently effective prices is unsustainable. In reviewing evidence regarding UNE prices for SBC Illinois that one of the authors presented to the Illinois General Assembly[35] (that likewise showed the ILEC, SBC Illinois, was losing a significant amount of money on out-of-pocket, cash expenditures), the eminent regulatory economist, and former chairman of the New York Public Service Commission, Professor Alfred Kahn, testified to the Illinois Legislature that:

> I find such a situation astounding. As a regulator, I could not possibly have justified setting any rates—unless they were explicitly subsidized by other rates—at such a level that it would require the company to lose huge numbers of dollars out-of-pocket, unless I had made some sort of a positive finding that its management was almost criminally negligent.[36]

Wall Street analysts, who are interested in assessing the long run viability of the ILECs and the impact on that viability of the UNE regime, have also performed detailed analyses of UNE prices under TELRIC. Specifically, there are three studies of which we are aware that have performed a quantitative analysis of UNE prices and costs.[37] Although these studies all use somewhat different methodologies, assumptions, and data, they reach the same qualitative conclusion that we report here, which is that current UNE prices typically and consistently fail to be compensatory relative to actual booked costs.

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35 Testimony of Dr. Debra J. Aron Before the House Public Utilities Committee and Senate Environment and Energy Committee of the Illinois State Legislature, May 5, 2003.

36 Testimony of Dr. Alfred E. Kahn Before the House Public Utilities Committee and Senate Environment and Energy Committee of the Illinois State Legislature, May 5, 2003.

37 Anna Maria Kovacs, *et al.*, "The Status of 271 and UNE-Platform in the Regional Bells' Territories," Commerce Capital Markets Equity Research, November 8, 2002; Adam Quinton, *et al.*, "The Telecommunicator: Telecom Act Seven Years On—The UNE Shock Wave Belatedly Reverberates Around the RBOCs—And How!," Merrill Lynch Global Securities Research & Economics Group, September 23, 2002; and John Hodulik, *et al.*, "How Much Pain from UNE-P?: Analysis of UNE-P Economics for the Bells," UBS Warburg Global Equity Research, August 20, 2002.

4.3. Evidence that UNE Prices Are Below Forward-looking Costs

The actual, booked costs of a firm and its forward-looking costs are related, and this relationship allows the use of actual costs as a reality check on otherwise unverifiable models, such as TELRIC. Forward-looking actual costs may or may not be lower than booked costs. There is no *a priori* reason that forward-looking costs necessarily must be lower (or higher) than the costs that are computed from the actual data that the company submits to the FCC in its ARMIS reports. If the most efficient forward-looking technology is cheaper than the technology in place in the existing network—because technology has become less costly, or the prices of key inputs, such as electronics or optical fiber, have declined—then forward-looking prices will be lower than actual booked costs, all else equal, even if the existing network is as efficient as possible given the available technology and input prices effective during the time period over which it was built. If, in contrast, the forward-looking technology is more costly than past technology—a theoretical possibility in light of the fact that newer technologies provide a far greater array of services than older technologies—this will drive forward-looking costs above actual booked costs. Moreover, the fact that the prices of many inputs, such as land, engineering and installation, as well as maintenance and other labor-related costs, have increased over time, would also drive forward-looking costs above book costs, all else equal. In fact, the cost of loop plant itself is driven in large part by labor costs, to the extent that placement is the key cost component of outside plant.[38] Under the accounting principles used for industrial firms in the U.S., long-term assets bought by a firm are carried on that firm's books at the purchase price, without making any upward adjustments for increases in the asset's nominal value due to inflation or particular circumstance (e.g., a change in the market value of downtown real estate property).[39] As a result, such asset values can be understated on the books relative to what a properly estimated forward-

[38] Reply testimony of Timothy Dominak of Behalf of SBC Indiana In the Matter of the Commission Investigating and Generic Proceeding of rates and Unbundled Network Elements and Collocation for Indiana Bell Telephone, Incorporated Pursuant to the Telecommunications Act of 1996 and Related Indiana Statutes, Cause No. 42393, September 5, 2003, p. 25.

[39] Gerald I. White, Ashwinpaul C. Sondhi, and Dov Fried, *The Analysis and Use of Financial Statements* (New York: John Wiley & Sons, 1998), p 334.

looking cost approach requires.[40] Hence, forward-looking hypothetical costs may be above or below booked costs even if the booked costs reflect a perfectly efficient firm.

Economists Dale Lehman and Dennis Weisman studied the magnitude of the difference that should be expected between a telephone carrier's booked costs and the forward-looking costs of its actual network.[41] They estimate the ILEC's forward-looking costs as the cost of the existing network, evaluated at current rather than historical prices. They identified three factors that would differ between such a forward-looking cost study and booked costs. First, they hypothesize that regulatory (booked) depreciation lives exceed forward-looking lives, which tends to make forward-looking costs lower, all else equal. Second, booked costs tend to use straight line depreciation, while the levelized cost of capital formula applied in TELRIC studies results in a higher forward-looking cost, all else equal, than booked cost. Finally, assuming that productivity increases over time, a TELRIC model would incorporate the decreasing investment costs immediately, while booked costs would reflect the decreased costs only over time. This tends to make the booked costs higher than the forward-looking costs, all else equal.

Lehman and Weisman argue that other factors need not differ systematically between forward-looking and booked costs. They perform a simulation analysis to estimate the effects of the three key factors taken together, assuming that the three parameters are uncertain, but with known distributions. The results of the analysis can be interpreted as bounding the reasonable range of differences between forward-looking and booked costs. According to the Lehman and Weisman study, 90% of the time, embedded costs should exceed forward-looking costs by –4% to 19%.[42] If

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[40] For example, in California, AT&T submitted testimony in which the authors estimated that one would have to adjust upward the existing base of SBC California's telephone loop plant on the order of 40 percent to reflect the "current" cost of that plant. See, Joint Declaration of Thomas L. Brand and Arthur Menko in Support of Joint Applicants' Opening Comments, U-5002-C, Before the California Public Utility Commission, Application 01-02-024, *et seq.*, October 18, 2002, ¶67.

[41] Dale E. Lehman and Dennis Weisman, *The Telecommunications Act of 1996: The "Costs" of Managed Competition* (Boston: Kluwer Academic Publishers, 2000), chapter 6. (Hereafter, *Lehman and Weisman*.)

[42] *Lehman and Weisman*, p. 76.

embedded costs systematically exceed estimated forward-looking costs by more than these amounts across jurisdictions or studies, one can conclude that the difference reflects factors other than those that reasonably reflect a forward-looking adjustment. In fact, commission-ordered TELRIC prices fall within this range in only 9 (or about 19 percent) of the 48 state observations (plus Washington D.C.) according to the Aron, Keith, and Pampush analysis described above in Section 4.2.

4.4. TELRIC prices vary widely between states in ways that cannot be explained by plausible cost drivers

The fact that TELRIC provides an undue amount of discretion to commissions suggests, for reasons we have articulated, that prices would reflect the varying political pressures and policy goals of different state commissions. If that were true, one would expect to find that UNE prices vary across states in ways that are not explained by costs. Our analysis of UNE prices suggests that state commissions have in fact adopted UNE prices that vary across states for reasons that have little to do with their relative costs. To test our hypothesis, we employed our data on UNE prices and booked (ARMIS-based) costs, and obtained data on other cost measures, in 47 states and the District of Columbia (Connecticut, Alaska, and Hawaii were excluded due to insufficient data). We ran OLS regressions of UNE-P price, as a function of the UNE-P cost, where cost was proxied in the following manner: (1) the number of access lines per square mile in the RBOC's service territory;[43] (2) an estimate of the historical UNE-P cost as reported in the FCC's ARMIS;[44] and (3) an estimate of the forward-looking UNE-P cost as proxied by the FCC's "synthesis" (or hybrid-cost proxy) model.[45] We hypothesize that, if the UNE prices adopted by state commissions are applied consistently across states and properly reflect the carriers' costs of providing UNEs, then the OLS model should "fit" the data closely; that is, the model's adjusted R-squared value should be close to one.

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43 Square miles in the RBOC service territory were obtained from the HCPM model results posted on the FCC's website. See, "HCPM Model Results (January 20, 2000)," downloaded from www.fcc.gov/wcb/tapd/hcpm.. (Hereafter, *HCPM Model Results 2000.*) Total lines correspond to the total billable access lines in 2001 from ARMIS Report 43-01, line 2150.

44 *Aron, Keith, and Pampush*, p. 22, Table 2.

45 *HCPM Model Results 2002.*

Our results reject this hypothesis. In the three single-variable regressions, we consider the individual effect of the three cost proxy variables. In each case, the adjusted R-squared value did not exceed 38 percent (see Table 1). In our fourth regression, we consider the effect of including all three cost proxies in the model together. In this case, the adjusted R-squared value is 42 percent. An adjusted R-squared value of 42 percent means that 58 percent (1.00 – 0.42) of the variability of UNE prices across the states is unexplained by *all* of the identified cost factors. In addition, we note that the FCC's cost proxy model, which itself is based on speculation about a hypothetical network, has no incremental explanatory power once line density and ARMIS costs are accounted for. Of course, we recognize that none of the cost proxies we identify are perfect proxies for forward-looking cost, but, as we have explained, there should be a systematic relationship between actual costs and forward-looking costs, and we would not expect it to vary wildly across states. The fact that UNE prices vary substantially in ways that are unexplained by these cost proxies reinforces our view that state commissions exercise their discretion in ways that are random with respect to costs.

Table 1:
Ordinary Least Squares Regression
Dependent Variable: UNE-P Price

Independent Variable	**Regression (1) : Coefficient Estimates**	**Regression (2) : Coefficient Estimates**	**Regression (3) : Coefficient Estimates**	**Regression (4) : Coefficient Estimates**
Intercept	5.052 (4.620)	8.823* (3.768)	42.091* (3.623)	25.083* (10.117)
ARMIS/Historical UNE-P Cost Estimate	0.558* (0.144)	--	--	0.304* (0.139)
FCC/Forward-Looking UNE-P Cost Estimate	--	0.565* (0.151)	--	0.087 (0.180)
Line Density, measured in natural logs	--	--	-3.733* (0.684)	-2.724* (0.957)
Observations	48	48	48	48
R-Squared	0.245	0.234	0.393	0.457
Adjusted R-Squared	0.229	0.218	0.380	0.420

* Significant at the 5% level

The effects of this behavior can be seen at the individual state level. As would be expected from the regression results, there are many obvious instances of anomalies in UNE prices across states. For instance, Arkansas and West Virginia have comparable line densities (79 and 65 lines per square mile, respectively), very similar ARMIS-based UNE-P costs ($42.31 and $39.59, respectively), but vastly different UNE-P prices, of about $20 and $44 per month, respectively. Indeed, according to these cost estimates, Arkansas is a *higher* cost state than West Virginia, yet its

UNE-P price is less than half that of West Virginia. Other examples of state pairings that demonstrate the perverse outcomes of UNE proceedings include Montana and Vermont, with comparable line densities of 58 and 70 respectively, comparable ARMIS-based costs of $30.93 and $31.46, respectively, and prices, of about $34 and $25 per month, respectively; and Maryland and Illinois with comparable line densities of 401 and 587 respectively, and ARMIS-based costs of $28.88 and $24.24, respectively, and prices, of about $26 and $12 per month respectively. There does not appear to be any rational cost basis for the magnitude of discrepancies seen in these cases.

5. Incentives for cost minimization

We have argued above that it is simply not a feasible regulatory policy to provide state commissions with virtually unconstrained discretion to determine what it *should* cost to produce telecommunications services and set prices equal to these hypothetical values. This is why any feasible regulatory mechanism must be much more closely based on the actual network design of the ILEC and the actual levels of efficiency it has achieved. The problem this raises, of course, is that basing prices on historically achieved levels of efficiency will generally not provide strong incentives for firms to attempt to achieve further increases in efficiency. We want to stress the fact that the supposed "solution" offered by TELRIC to this problem – that omniscient regulators will gather objectively verifiable evidence on what it should cost and set prices equal to this – is really no solution at all but rather an exercise in wishful thinking that has led to the problems we currently face. Furthermore, since most ILEC sales occur under price caps, we believe that ILECs' incentives for cost minimization may already be nearly as strong as it is possible to make them. Moreover, facilities-based competition, where it already exists, and the threat of increasing competition, provide further powerful incentives for efficiency. The incremental gain from introducing further incentive mechanisms into the UNE pricing process may therefore be relatively small. In the following discussion we document the evolution in the U.S. away from rate-of-return regulation to incentive-based, price-cap regulation. We describe the social benefits that have accrued from adopting price-cap regulation and we articulate the important structural components of price-cap regulation that are largely responsible for this outcome.

Until the 1980s, before ILECs faced significant competition of any kind, ILECs were commonly subject to rate-of-return regulation. By the 1980s, it was recognized that rate-of-return regulation produced neither socially efficient investment decisions nor efficient operations.[46] As a result, in the late 1980s, state Commissions began dropping rate-of-return regulation and adopting alternative forms of regulation (see Table 2). For a brief period in the 1990s, earnings sharing regulation was the predominant form of state regulation. Today, however, earnings sharing regulation has been abandoned entirely and only six states still impose rate-of-return regulation. In contrast, price cap regulation has proven itself over many years around the country. It is now present in 43 states and is by far the predominant form of regulation in the U.S. today.

46 David E. M. Sappington, "Price Regulation," *Handbook of Telecommunications Economics Volume I* (Amsterdam: Elsevier Science Publishers B.V., 2002), pp. 240-242.

Table 2

State regulation of Major Local Exchange Services Carriers

Year	Rate-of-Return Regulation	Incentive-Based Regulation		
		Earnings Sharing Regulation	Price-Cap Regulation	Other (e.g., Rate Case Moratoria)
1989	29	8	0	13
1992	18	20	3	9
1995	18	17	9	6
1998	13	2	30	5
2000	7*	1	40	3
2002	6	0	43†	2

Notes:

* According to a 2000 report by Warren Publishing, Inc., the states of New Hampshire, Alaska, Arizona, Hawaii, Montana, New Mexico, and Washington had their largest incumbents under rate-of-return regulation as of October 2000. Small to mid-sized incumbents generally remained under rate-of-return regulation in most states, although many smaller incumbents had the option of alternative regulation plans. See "States Found to Use consistent Pattern in Regulating Local Rates," *Communications Daily*, November 1, 2000.

† In Massachusetts, the price cap plan for Verizon expired in August 2001. The Department of Telecommunications and Energy is currently considering a Verizon proposal for a new 5-year cap plan. Decisions on this plan are expected to be issued in the course of 2003. In West Virginia, Basic services are capped at their current levels, access charges are capped, and competitive categories are deregulated.

Sources: LECG analysis of state Commission websites; David E. M. Sappington, "Price Regulation," *Handbook of Telecommunications Economics Volume I* (Amsterdam: Elsevier Science Publishers B.V., 2002), Table 2, p. 237; and *Communications Daily White Paper*, Vol. 22, No. 58, March 26, 2002.

Price cap regulation is intended to safeguard consumers by directly limiting the prices of a regulated carrier, while leaving it to the company to maximize its profits subject to that constraint. Price cap regulated firms can attempt to increase their profits by increasing their efficiency (and lowering their costs), or perhaps by increasing the demand for their services by enhancing their quality and desirability. In other words, price cap plans break the direct regulatory link between cost and price that prevails under rate-of-return regulation, and thereby spur the ILEC to become more efficient and innovative. Price cap plans also negate a number of perverse incentives that are created by rate-of-return regulation. These efforts, if successful, benefit social welfare. The beneficial incentive properties that ensue from breaking the regulatory link between cost and price are well understood in the economics literature, as is demonstrated in a recent article on this topic:

> Under pure PCR [price-cap regulation], the link between the firm's [actual] costs and its prices is severed. The superior incentive properties of PCR derive in large measure from breaking this link between costs and prices. In other words, because the regulated firm retains one-hundred percent of its efficiency improvements, it has ideal incentives to strive for maximum efficiency. The regulator can thus be assured that the regulated firm will enlist its informational advantage to improve efficiency.[47]

The positive incentives created by price caps were also explained by economists Robert Crandall and Leonard Waverman in their book, *Talk Is Cheap: The Promise of Regulatory Reform in North American Telecommunications*:

> Under the pure form of PC [price cap] regulation...the firm has no incentive to substitute artificially one input (such as capital) for another (such as labor). The reasoning is simple. ...Under PC regulation, inefficiently substituting capital for labor...only decreases profits. ...Input distortions are not induced by PC regulation.
>
> PC regulation thus provides the correct incentives for cost minimization. A dollar of increased unnecessary costs cannot be collected from customers (as they can in ROR regulation) ...Unnecessary costs thus will be avoided by a

47 Dennis L. Weisman, "Is There '*Hope*' for Price Cap Regulation?," *Information Economics and Policy*, 14 (2002), p. 354. (Hereafter, *Is There 'Hope.'*)

> firm under PC regulation. An important corollary follows—there is little need for the regulator to examine judiciously the firm's costs, and thus the informational requirement is lessened.[48]

Similarly, Kip Viscusi, *et al.* explain in their text, *Economics of Regulation and Antitrust*: "Price cap regulation is viewed as providing incentives for the firms so regulated to be cost efficient."[49]

The beneficial effects of incentive regulation are not just theoretical but have been demonstrated empirically. For example, Majumdar (1997) studied the impact of incentive regulation plans on the relative technical efficiency of 45 local exchange companies in the U.S. between 1988 and 1993. He found that "the introduction of price-cap schemes alone as a replacement for a rate-of-return regime has a strong and positive, but lagged, effect on the technical efficiency of local exchange carriers."[50]

In a similar study that examined the impact of incentive regulation on ILEC innovation, Prieger (2001) concludes that the level of new service introduction increased substantially when rate-of-return regulation was replaced by price cap regulation. In particular, the author studied Indiana, where the price cap plan is known as "Opportunity Indiana," concluding that:

> Ameritech greatly increased its rate of service introduction under Opportunity Indiana [price cap regulation]. The estimated rate of service creation under Opportunity Indiana is 2 to 4.5 times the rate under the rate-of-return regime. Expected approval delay times were reduced to almost nothing (from over 130 days before Opportunity Indiana to under four days during). During Opportunity

[48] Crandall and Waverman, pp. 108-109.

[49] W. Kip Viscusi, John M. Vernon, and Joseph E. Harrington, Jr., *Economics of Regulation and Antitrust*, Second Edition, (Cambridge, MA: The MIT Press, 1995), p. 386.

[50] Sumit K. Majumdar, "Incentive Regulation and Productive Efficiency in the U.S. Telecommunications Industry," *Journal of Business*, Vol 70, No. 4 (1997), pp. 571-572. Note that the lags he refers to were 1 to 2 years, significantly less time than the period that price caps have been in effect in most jurisdictions.

> Indiana, proposed services had a higher probability of being approved as quickly as the law allowed, and the law allowed quicker introductions. Using the estimated model to project the innovation and introduction process under [rate-of-return regulation] and Opportunity Indiana, I find that Ameritech would have introduced up to twelve times as many services to consumers during the study period if Opportunity Indiana had been in place the entire time.[51]

The empirical literature clearly documents the benefits that have accrued from adopting appropriate incentives. Economist Dennis Weisman characterizes this accomplishment as follows:

> The pervasive adoption of PC regulation (PCR) is arguably one of the crowning achievements of regulatory economics this past century. Indeed, it would be difficult to identify a contribution to theoretical regulatory economics that has had a more profound and lasting impact in changing the regulatory landscape.[52]

6. The proposed FLEC methodology

All of the above factors lead us to conclude that a reasonable and practical approach for the Commission to follow would be to adopt a methodology of the sort suggested by SBC that attempts to estimate the true forward-looking cost that the ILEC is actually likely to incur by instructing regulatory commissions to use the ILEC's actual network and the actual levels of efficiencies, including fill factors, that it has achieved perhaps projected a short period into the future, in which reasonably certain predictions could be made based on the ILEC's network plans. To deal with the fact that some types of equipment used in the network are no longer commercially available, this rule would have to be modified to allow for functionally equivalent equipment that is currently available to be substituted for equipment that is no longer available.

[51] James E. Prieger, "Telecommunications Regulation and New Services: A Case Study at the State Level," *Journal of Regulatory Economics*, Vol. 20, No. 3 (2001), p. 287.

[52] *Is There 'Hope,'* p. 1. (Footnotes omitted.)

We believe that the FLEC methodology we propose, which bases cost calculations on the ILEC's current network design (as it will be modified over a reasonable future period for which the ILEC can reasonably plan network upgrades) and the ILEC's currently achieved levels of efficiency, provide a reasonable approach to estimating ILECs' true forward costs, while at the same time providing a relatively concrete standard that can be based more firmly on objectively verifiable data. We consider this approach to be sound and valid whether or not one acknowledges concerns about regulatory expropriation, because our proposed methodology addresses fundamental limitations on regulators' ability to reliably identify and predict achievable efficiencies. Given the additional need to provide state regulators with an institution that allows them to credibly commit to reimbursing ILECs for their investment, we believe that this represents the best possible solution to a difficult problem.

Finally, on the issue of incentives for cost minimization, as we discussed in Section 6, strong incentives for efficiency are created by the facts that (i) most ILEC sales are subject to price caps, and (ii) ILECs are subject to existing and anticipated future competition. This means that the incremental gains from attempting to introduce some sort of more explicit incentive mechanism in the UNE pricing process would be limited. Furthermore, we note that since TELRIC prices are generally calculated every three years, some mild additional incentives for cost efficiency may be created by the regulatory lag that results.

The principle we espouse, that sound public policy and economic principles dictate that forward looking UNE costs reflect today's actual network implies, for example, that UNE prices should be based on the actual fill factor implicit in the current network implementation. Current fill factors reflect the companies' resolutions to the cost tradeoffs we identified earlier between placing spare capacity in advance and holding "inventory," or waiting to place capacity on demand. It is reasonable to infer that the current network configuration reflects acceptably efficient resolutions to those tradeoffs because, as we also discussed earlier, virtually all of the large ILECs across the country operate under price cap regulation, which provides high-powered incentives for cost-reducing behavior, and these companies are held accountable by their shareholders to perform on those incentives. Existing and anticipated competition from facilities based competitors provides additional incentives for efficiency.

In addition, actual networks reflect the effects of the incumbents' ready-to-serve, universal service, and quality standard requirements, and the spare capacity necessary to meet them. These are real costs that are forward looking and are appropriately captured in UNE prices.

Of course, network utilization may fall in the future (spare capacity may rise) as competition increases. Competition decreases the predictability of a firm's market share and increases its variability, which tends to increase the efficient amount of spare capacity to hold. We believe that the effect of competition on network utilization will be accounted for over time in the same way that other changes in costs will be accounted for: namely, in periodic UNE review proceedings. This approach of relying on observed changes to the network rather than speculation or hypothesis answers the overarching concern we have expressed about the current TELRIC methodology, which is that it provides excessive discretion to regulators. A fundamental principle of UNE pricing must be that the cost measure be tied to objectively measurable data in order to provide a discipline on the process.

7. Conclusion

The current TELRIC methodology used to determine UNE prices results in prices that do not provide ILECs with an opportunity to recover the forward-looking costs of providing these UNEs. This dampens ILEC incentives for investment, and the problem will grow worse as CLECs respond to below-cost prices for UNEs by purchasing an ever-growing share of ILECs' services. In addition, mandating below-cost UNE prices essentially amounts to offering CLECs a subsidy only if they agree to enter without investing in their own facilities. The policy therefore inefficiently distorts the mode of CLEC entry away from facilities based entry and towards UNE based entry. The two main reasons that the current TELRIC approach results in prices that are too low is that (i) its blank-slate methodology causes it to ignore real factors that increase ILECs' costs that are not inefficiencies and (ii) its focus on the hypothetically most efficient network instead of the ILEC's actual network places insufficient objective constraints on regulators to set prices at compensatory levels. These problems could be best solved by adopting a methodology that attempts to calculate the forward-looking cost of building the network the ILEC has actually built, as it will evolve over a reasonable planning period, using the levels of efficiency it has actually achieved.

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PUBLICATIONS AND WORKING PAPERS

"Broadband Adoption in the United States: An Empirical Analysis," with David E. Burnstein, in *Down to the Wire: Studies in the Diffusion and Regulation of Telecommunications Technologies,* Allan Shampine, ed., (Nova Science Publishers, Hauppauge, NY, 2003).

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"The Role of Managerial Ability and Moral Hazard in the Determination of Firm Size, Growth and Diversification," Ph.D. Dissertation, University of Chicago, August 1985.

REPRESENTATIVE PRESENTATIONS

"The High Cost of Proposed New Wireless Regulations," Presentation to the Pacific Research Institute conference "Regulating Wireless in California: Bill of Rights... or Wrongs?," San Francisco, April 2003.

"The TELRIC Showdown," Panelist, NARUC Staff Subcommittee on Telecommunications, 2002 Annual Convention, Chicago, Illinois, November 2002.

"Economic Principles for Efficient Pricing of Municipal Rights-of-Way," National Association of Telecommunications Officers and Advisors (NATOA), Chicago, Illinois, September 2002.

"Trends in Voice and Broadband Competition in Telecommunications Markets: Markets, Strategies, and Regulation," 82nd Annual Convention of the Indiana Telecommunications Association, Lexington, Kentucky, June 2002.

"Broadband Deployment in the United States," Emerging Opportunities in Broadband Symposium, Northwestern University, Evanston, Illinois, December 2001.

"Local Competition in Illinois," Illinois Telecommunications Symposium, Northwestern University, Evanston, Illinois, December 2000.

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"Competitive and Strategic Use of Optional Calling Plans and Volume Pricing Plans," The Institute for International Research Conference for Competitive Pricing of Telecommunications Services, Chicago, Illinois, July 1998.

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"Corporate Spin-offs in an Agency Framework," Western Finance Association Meetings, Seattle, Washington, June 1989.

"Corporate Spin-offs in an Agency Framework," University of Rochester, Rochester, New York, May 1989.

"Corporate Spin-offs in an Agency Framework," North American Summer Meetings of the Econometric Society, Minneapolis, Minnesota, June 1988.

"Competition, Relativism, and Market Choice," North American Summer Meetings of the Econometric Society, Berkeley, California, June 1987.

"Competition, Relativism, and Market Choice," University of Chicago, Chicago, Illinois, April 1987.

"Rate Reform and Competition in Electric Power," Discussant, Conference on Competitive Issues in Electric Power, Northwestern University, Evanston, Illinois, March 1987.

"Worker Reputation and Productivity Incentives," New Economics of Personnel Conference, Arizona State University, Tempe, Arizona, April 1986.

"Ability, Moral Hazard, and Firm Diversification," Various Universities, 1985, 1994, including Yale University, University of Rochester, Stanford University, University of Minnesota, California Institute of Technology, Duke University, Northwestern University, Brown University, Harvard University, University of California - Los Angeles, University of Pennsylvania.

ACADEMIC JOURNAL REFEREEING

Dr. Aron has served as a referee for *The Rand Journal of Economics, the Journal of Political Economy, the Journal of Finance, the American Economic Review, the Quarterly Journal of Economics, the Journal of Industrial Economics, the Journal of Economics and Business, the Journal of Economic Theory, the Journal of Labor Economics, the Review of Industrial Organization, the European Economic Review, the Journal of Economics and Management Strategy, the International Review of Economics and Business, the Quarterly Review of Economics and Business, Management Science, the Journal of Public Economics, the Journal of Institutional and Theoretical Economics*, and the National Science Foundation.

SELECTED TESTIMONY AND OTHER ENGAGEMENTS

Expert testimony before the Illinois General Assembly regarding the effects of current regulated UNE pricing of telecommunications elements on competitive telecommunications markets in Illinois, May 2003.

Expert testimony before the Pubic Utilities Commission of Ohio on issues related to rights-of-way fees charged to electric, water, and telecommunications companies in the City of Toledo, Ohio, March 2003.

Report evaluating the cost impacts and public policy implications of the proposed California Consumer Protection rules on wireless carriers and customers, February 2003.

Expert testimony before the state regulatory commissions in Ohio, Illinois, Indiana, and Kansas on the economic principles for evaluating anticompetitive claims regarding "winback" pricing by incumbent telecommunications carriers, 2002 - 2003.

Report pertaining to the economic and antitrust analysis of price squeezes, and the suitability of imputation rules as a protection against an anticompetitive price squeeze, for a carrier in a foreign market, 2002.

Expert testimony before the Michigan Public Service Commission pertaining to allegations of anticompetitive effects of long term contracts, 2002.

For a small manufacturer of telecommunications equipment, consulting support to evaluate the antitrust implications of a proposed acquisition, 2002.

White Paper submitted to the Texas Public Service Commission pertaining to the competitive effects of "winback" and "retention" pricing, 2002.

In Order Instituting Rulemaking on the Commission's Own Motion to Assess and Revise the new Regulatory Framework for Pacific Bell and Verizon California Incorporated, written declaration submitted to the California Public Utilities Commission pertaining to the economic incentives created by modifications to the State's alternative regulation plan and competitive reclassification of services, 2002.

Statement to the Federal Communications Commission regarding the potential economic causes of sustained price increases for cable television services, 2002.

Expert testimony before the Kansas Corporation Commission regarding the antitrust principles relevant to establishing rules for competitive reclassification of services under governing state law, 2002.

For a national wireless telecommunications carrier, consulting support pertaining to litigation regarding access charges, 2001.

Expert testimony before the Missouri Public Service Commission pertaining to price squeeze allegations in the long-distance market, 2001.

Expert affidavit submitted to the Circuit Court in the state of Wisconsin, pertaining to irreparable harm caused if court declined to grant a stay of disputed performance remedy plan, 2001.

Expert testimony before the public utilities commissions of Illinois, Ohio, California, and Indiana, pertaining to the economic viability of constructing and provisioning ADSL services, including market definition and examination of competitive conditions, 2001.

Expert testimony before the Illinois Commerce Commission pertaining to the proper economic principles governing unbundling obligations, 2001.

In the matter of H & R Mason Contractor's et al. v. Motorola, Inc. et al., before the Circuit Court of Cook County, Illinois, expert affidavit examining the economic impediments to class certification, focusing on the determinants of price in the relevant equipment markets, April 2001.

For a competitive local exchange provider in a foreign market, consulting support regarding the proper determination of avoided costs for resale of incumbent services, April 2001.

For a major Japanese telecommunications equipment manufacturer, evaluated the revenue potential and desirability of entering several advanced services equipment markets worldwide, for the purposes of assisting the client to evaluate a proposed acquisition, February 2001.

Expert testimony in the Illinois Commerce Commission's Investigation Into Certain Payphone Issues, examined the economic and public policy issues pertaining to pricing of access lines for independent pay telephone providers, April 2001.

In the matter of the Illinois Public Utility Commission's Investigation Into Tariff Providing Unbundled Local Switching And Shared Transport, expert testimony regarding economic antitrust perspectives on obligations of firms to affirmatively help their competitors, and related public policy issues, April 2001.

In response to Request for Consultations by the U.S. Trade Representative (USTR) with the Government of Mexico before the World Trade Organization (WTO) regarding barriers to competition in Mexico's telecommunications market, analyzed regulated switched access rates in the U.S. in comparison with those charged by Telmex, November 2000.

Declaration submitted to the Texas Public Utility Commission, analyzed proposed regulation aimed at preventing incumbents from executing a price squeeze; developed a framework for evaluating claims of a price squeeze consistent with antitrust principles of predation, August 2000.

For a taxicab company, analysis of regulatory requirements in the City of Chicago pertaining to valuation of medallions and valuation of capital for purposes of regulatory ratemaking proceeding, 2000.

Written and oral testimony before the public utility commissions of Illinois and Michigan in various arbitration matters pertaining to the proper compensation for the use by competitors of client's facilities for foreign exchange services, 2000.

For a firm in the aluminum fabrication industry, in the matter of a potential merger between vertically integrated competitors, developed a methodology for adjusting the HHI measure of market concentration to account for the vertical control by the merging parties of downstream competitors, 2000.

For a large newspaper publisher, in the possible acquisition of the San Francisco Chronicle, analyzed the potential antitrust impediments to an acquisition by the client of the Chronicle, including issues of geographic and product market definition, the interplay between advertising markets and customer markets, and the relevant implications of the Newspaper Preservation Act, 1999.

Testimony before the Illinois Commerce Commission regarding the proper economic interpretation of the standards for declaring a service competitive under the Illinois Public Utilities Act, and quantification of the extent of competition in relevant Illinois markets, including discussion of market definition; the relevance of entry conditions; the relevance of resale competition and analysis of various resale entry strategies; the interdependence of resale and facilities-based entry strategies; and implementation of a technology-based method of measuring market participation, 1999-2000.

For a firm in the consumer mapmaking business, analyzed market definition, concentration, and efficiencies from a proposed merger, 1999.

Affidavit submitted jointly with Robert G. Harris to the Federal Communications Commission in the matter of "unbundled network elements" and commenting on the proper interpretation of the "Necessary and Impair" standard, including discussion of entry conditions and the business-case approach to valuation of an entry strategy, April 1999; reply affidavit May 1999.

Affidavit, "An Analysis of Market Power in the Provision of High-Capacity Access in the Chicago LATA," submitted to the Federal Communications Commission, including an analysis of the US DOJ merger guidelines and their applicability to regulatory relief in a regulated market, as well as extensive empirical modeling of the costs and business case for network buildout of high capacity facilities, February 1999.

White Paper, "Proper Recovery of Incremental Signaling System 7 (SS7) Costs for Local Number Portability," submitted to the Federal Communications Commission, April 1999.

PROFESSIONAL ORGANIZATIONS

Member, Telecommunications Policy Research Conference Program Committee

Member, American Economic Association

Member, Econometric Society

Associate Member, American Bar Association

PERSONAL INFORMATION

Born: March 15, 1957
Los Angeles, CA

November 2003

December 2003

Curriculum Vitae

William P. Rogerson

Personal

Date of birth:	November 7, 1955
Citizenship:	American
Addresses: (Home):	494 Ash Street Winnetka, IL 60093 (847) 441-8160
(Office):	Department of Economics 2003 Sheridan Road Northwestern University Evanston, IL 60208 phone: (847) 491-8484 fax: (847) 491-7001 e-mail: wrogerson@northwestern.edu

Education

B.A., Economics, University of Alberta, 1976
Ph.D., California Institute of Technology, 1980

Current Employment

Professor of Economics, Northwestern University

Honors ,Awards and Research Grants

Graduated from the University of Alberta with distinction, 1976
Earl C. Anthony Fellowship, 1976-77
Canada Council Doctoral Fellowship, 1979-80
Shelby Cullom Davis Fellowship, 1979
NSF Grant SES-8320451, "Moral Hazard, Reputation, and Product Quality," March 1984 - March 1985
NSF Grant SES-8504304, "Moral Hazard, Reputation, and Product Quality," April 1985 - September 1987
NSF Grant IRI-8705477, "Contracting Under Asymmetric Information," July 1987 - December 1989

Named to Household International Professorship in Economics, September 1987 - August 1989
Lynde & Harry Bradley Foundation Research Grant, "An Economic Analysis of Defense Procurement Regulations," June 1989 - December 1991.
NSF Grant SES-8906751, "Profit Regulation of Defense Contractors," August 1, 1989 - July 31, 1991.
Olin Fellow at The Center for the Study of the Economy and the State, University of Chicago, October 1, 1989 - June 30, 1990.
Smith Richardson Foundation, Inc. Research Grant, "Economic Incentives and the Defense Procurement Process," March 1, 1993 - May 31, 1995.
Elected a Fellow of the Econometric Society, 1999.
Searle Fund for Policy Research Research Grant, "Regulation of Interconnection Between Telecommunications Carriers in the Emerging Competitive Environment," June 2002-May 2004.

Research and Teaching Interests

Industrial Organization, Regulation, Telecommunications, Cost Accounting, Defense Procurement, and Health Care.

Employment History

Research Assistant to Canadian Member of Parliament, Arnold Malone, June 1975 - September 1975
Teaching Assistant at University of Alberta, September 1975 - June 1976
Economist, Department of Industry, Trade and Commerce, Government of Alberta, June 1976 - September 1976
Research Assistant, Environmental Quality Laboratory, Caltech, June 1977 - September 1977
Economist, Long Range Planning and Structural Analysis Division, Department of Finance, Government of Canada, June 1978 - September 1978
Teaching Assistant to Professor Charles R. Plott, Division of Humanities and Social Sciences, Caltech, September 1979 - June 1980
Assistant Professor of Economics, Stanford University, September 1980 - August 1984
Associate Professor of Economics, Northwestern University, September 1984 - May 1990
Professor of Economics, Northwestern University, May 1990 - Present
Chair, Economics Department, Northwestern University, September 1996 - August 1998.
Chief Economist, Federal Communications Commission, June 1, 1998-May 31, 1999 (on leave from Northwestern for this year.)
Director, Northwestern Program in Mathematical Methods in the Social Sciences, September 2000- present.

Professional Activities

Editor of Defense and Peace Economics, January 1995 - December 1998.
Member of the editorial board of Defense and Peace Economics, September 1991 - December 1998.
Member of the editorial board of Review of Accounting Studies, September 1993 to present.
Member of the editorial board of Journal of Industrial Economics, October 1995- Sept. 1998.
Chief Economist of Federal Communications Commission, June 1, 1998 - May 31, 1999.
Member of the Illinois Economic Policy Council, September 1999 to September 2000
Director, Northwestern Program in Mathematical Methods in the Social Sciences, September 2000- present.
Member of Northwestern's Program Review Committee, September 2000 - June 2003.
Chair of Northwestern's Program Review Committee, September 2002 - June 2003.
Co-Director, Center for the Study of Industrial Organizaiton (CSIO), September 2001- present.
Consultant to: Federal Communications Commission, Federal Trade Commission, Institute for Defense Analysis, Logistics Management Institute, Office of the Secretary of Defense (Program Analysis and Evaluation), RAND Corporation, US Department of Justice.

Refereed Publications

"Aggregate Expected Consumer Surplus As a Welfare With an Application to Price Stabilization," Econometrica, 49, No. 2, (March 1980), pp. 423-436.
"Agriculture in Development: A Game-Theoretic Analysis," with Robert Bates, Public Choice, 35, (1980), pp. 513-527.
"The Social Costs of Monopoly and Regulation: A Game-Theoretic Analysis," Bell Journal of Economics, 13, No. 2, (Autumn 1982), pp. 391-401.
"Reputation and Product Quality," Bell Journal of Economics, 14, No. 2, (Fall 1983), 508-515.
"Consumer Misperceptions, Market Power and Product Safety," with Mitchel Polinsky, Bell Journal of Economics, 14, No. 2, (Fall 1983), 581-589.
"A Note on the Incentive for a Monopolist to Increase Fixed Costs as a Barrier to Entry," Quarterly Journal of Economics, 396, May 1984, 399-402.
"Efficient Reliance and Damage Measures for Breach of Contract," Rand Journal of Economics, Spring 1984, 39-53.
"Repeated Moral Hazard," Econometrica, 53, January 1985, 69-76.
"The First-Order Approach to Principal Agent Problems," Econometrica, 53, November 1985, 1357-1368.
"Robust Trading Mechanisms" with Kathleen Hagerty, Journal of Economic Theory, 42, June 1987, 94-107.
"The Dissipation of Profits by Brand Name Capital and Entry When Price Guarantees Quality," Journal of Political Economy, 95, August 1987, 797-809.

"A Note on the Existence of Single Price Equilibrium Price Distributions," Review of Economic Studies, 54, April 1987, 339-342.

"Price Advertising and the Deterioration of Product Quality," Review of Economic Studies, 55, April 1988, 215-230.

"Profit Regulation of Defense Contractors and Prizes for Innovation," Journal of Political Economy, 97, December 1989, 1284-1305.

"Quality vs. Quantity In Military Procurement," American Economic Review, 80, March 1990, 83-92.

"Excess Capacity in Weapons Production: An Empirical Analysis," Defence Economics, 2, 1991, 235-250.

"Optimal Depreciation Schedules for Regulated Utilities," Journal of Regulatory Economics, 4, 1992, 5-33.

"Contractual Solutions to the Hold-Up Problem," Review of Economic Studies, 59, October 1991, 777-794.

"Incentives, the Budgetary Process, and Inefficienctly Low Production Rates in Defense Procurement," Defence Economics, 3, 1991, 1-18.

"Overhead Allocation and Incentives for Cost Minimization in Defense Procurement," The Accounting Review, 67, 1992, 671-690.

"Choice of Treatment Intensities by a Nonprofit Hospital Under Prospective Pricing," Journal of Economics and Management Strategy, 3(1), Spring 1994, 7-52..

"Economic Incentives and the Defense Procurement Process," Journal of Economic Perspectives, 8(4), Fall 1994, 65-90.

"Inter-Temporal Cost Allocation and Managerial Investment Incentives," Journal of Political Economy, 105(4), 1997, 770-795.

"The Regulation of Broadband Telecommunications, The Principle of Regulating Narrowly Defined Input Bottlenecks, and Incentives for Investment and Innovation," University of Chicago Legal Forum, 2000, 119-147.

"Simple Menus of Contracts in Cost-Based Procurement and Regulation," American Economic Review, 93(3), June 2003, *919-926.*

Other Publications

"Electric Generation Plants" Appendix F.1 in Implementing Tradable Emissions Permits for Sulfur Oxides Emissions in the South Coast Air Basin, Vol. II, by Glen R. Cass, Robert W. Hahn, Roger G. Noll, ARB Contract No. A8-141-31, June 30, 1982.

"A Comment on Political Institutions and Fiscal Policy: Evidence from the U.S. Historical Record," Journal of Law Economics and Organization, 6, Special Issue, Conference on "The Organization of Political Institutions", 1991, 155-166.

"Inefficiently Low Production Rates in Defense Procurement: An Economic Analysis," Leitzel, Jim and Jean Tirole, eds., Incentives in Defense Procurement. Boulder: Westview Press, 1993.

Profit Regulation of Defense Contractors and Prizes for Innovation, RAND, R-3635-PA&E, 1991.

An Economic Framework for Analyzing DoD Profit Policy, RAND, R-3860-PA&E, 1991.

Overhead Allocation and Incentives for Cost Minimization in Defense Procurement, RAND, R-4013-PA&E, 1992.

"Review of 'A Theory of Incentives in Procurement and Regulation,'" book review, Journal of Political Economy, 102, 1994, 397-402

On the Use of Transfer Prices in DoD: The Case of Repair and Maintenance of Depot Level Reparables by the Air Force, Logistics Management Institute Paper PA303RD2, January 1995, Logistics Management Institute, McLean, VA.

"Incentive Models of the Defense Procurement Process," in Hartley, Kieth, and Todd Sandler, eds., The Handbook of Defense Economics, North Holland, 1995, 309-346..

"The Economics of University Indirect Cost Reimbursement in Federal Research Grants," (with Roger Noll) in Roger Noll, ed., Challenges to the Research University. Washington: Brookings Institution, 1997.

"New Economic Perspectives on Telecommunications Regulation," (review of Competition in Telecommunications, bu Jean-Jacques Laffont and Jean Tirole), University of Chicago Law Review, 67, Fall 2000, 1489-1505.